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Applicant	:	**John Sievers, et al.**	
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Examiner	:	**Christopher G. Findley**	
Docket No.	:	**199-0231US**	
Customer No.	:	**29855**	
Title	:	**METHOD AND APPARATUS FOR IMPROVING THE AVERAGE IMAGE REFRESH RATE IN A COMPRESSED VIDEO STREAM**	

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APPEAL BRIEF

TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The real party in interest is Polycom, Inc.

II. RELATED APPEALS AND INTERFERENCES

There are no related proceedings.

III. STATUS OF CLAIMS

Claims 1–33 are rejected and are appealed.

IV. STATUS OF AMENDMENTS

None filed

V. SUMMARY OF CLAIMED SUBJECT MATTER

This section provides a concise explanation of the subject matter defined in each of the independent claims involved in the appeal, referring to the specification by paragraph and line number and to the drawings by reference characters as required by 37 CFR § 41.37(c)(l)(v).. Where applicable, each element of the claims is identified with a corresponding reference to the specification and drawings. Citation to the specification and/or drawings does not imply that limitations from the specification and drawings should be read into the corresponding claim element. Additionally, references are not necessarily exhaustive, and various claim elements may also be described at other locations.

Independent claim 1 recites a method of quality-improvement of a digitally-encoded video sequence, wherein the video sequence comprises information representing a sequence of encoded frames, each encoded frame comprising one or more encoded macroblocks. The method includes:

- determining one or more processing capabilities of a decoder that will decode the video sequence (¶ 0034, ll. 3–4; ¶ 0036, ll. 1–2);
- encoding macroblocks of a first image (¶ 0031, ll. 4–5);
- encoding macroblocks of subsequent images, wherein some macroblocks are skipped (¶ 0032; ¶ 0036, ll. 4–7); and

- increasing video quality as a function of a fraction of macroblocks that are skipped to take advantage of decoder processing capability that would otherwise be unused as a result of the skipped macroblocks (¶ 0034–0035).

Independent claim 15 recites a video conferencing terminal. The video conferencing terminal includes:

- one or more image processing engines adapted to encode a video signal, wherein some macroblocks are skipped (¶ 0032; ¶ 0036, ll. 4–7; Fig. 2, #210); and
- a communication interface adapted to determine one or more processing capabilities of a decoder that will decode the encoded video and further adapted to increase video quality as a function of a fraction of macroblocks that are skipped to take advantage of decoder processing capability that would otherwise be unused as a result of the skipped macroblocks (¶ 0034–0035; ¶ 0036, ll. 1–2; Fig. 2, #212).

Independent claim 22 recites a method of quality-improvement of a digitally-encoded video sequence. The method includes:

- determining one or more processing capabilities of a decoder that will decode the video sequence (¶ 0034, ll. 3–4; ¶ 0036, ll. 1–2; ¶ 0047);
- increasing video quality as a function of an encoder model of decoder processing load to take advantage of decoder processing capability that would otherwise be unused (¶ 0048–0049).

Independent claim 27 recites a video encoder. The video encoder includes one or more image processing engines (Fig. 2, #210) adapted to:

- encode a video signal (¶ 0031, ll. 4–5);
- determine one or more processing capabilities of a decoder that will decode the encoded video sequence (¶ 0034, ll. 3–4; ¶ 0036, ll. 1–2; ¶ 0048–0049); and

- increase video quality as a function of an encoder model of decoder processing load to take advantage of decoder processing capability that would otherwise be unused (¶ 0048–0049).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 22–27 and 30–31 stand rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent 7,114,174 to Brooks et al. ("Brooks"). Review of this rejection, specifically with respect to independent claims 22 and 27, is sought.

Claims 1–21, 28–29, and 32–33 stand rejected under 35 U.S.C. § 103(a) as obvious over Brooks in view of U.S. Pre-Grant Publication 2005/0041740 to Sekiguchi et al. ("Sekiguchi"). Review of this rejection, specifically with respect to independent claims 1 and 15, is sought.

VII. ARGUMENT

The claims do not stand or fall together. Instead, separate arguments for the claims are presented below grouped under subheadings as required by 37 C.F.R. § 41.37(c)(vii).

A. Claims 22–27 And 30–31 Are Not Anticipated By Brooks

Independent claim 22 is drawn to a method of improving the quality of a digitally-encoded video sequences and recites two limitations. These are: (1) determining one or more processing capabilities of a decoder that will decode the video sequence; and (2) increasing video quality as a function of an encoder model of decoder processing load to take advantage of decoder processing capability that would otherwise be unused. These limitations are not found in the cited art. Independent claim 27 is drawn to a video encoder and including one or more image processing engines that "determine one or more processing capabilities of a decoder" and "increase video quality as a function of an encoder model of decoder processing load to take advantage of decoder processing capability that would otherwise be unused." Claims 23–26 and 30–31 depend from claims 22 and 27, respectively. Each of these claims is allowable for at least the reasons set forth below.

Examiner rejected claim 22 as follows:

> Brooks discloses a method of quality-improvement of a digitally-encoded video sequence, the method comprising: determining one or more processing

> capabilities of a decoder that will decode the video sequence (Brooks: Figs. 6A and 6B; column 10, lines 1–15); and increasing video quality as a function of an encoder model of decoder processing load to take advantage of decoder processing capability that would otherwise be unused (Brooks: Fig. 6A; column 3, lines 8–14).

Office Action Mailed November 14, 2008 at 5. Claim 27, drawn to a video encoder including one or more video processing engines adapted to perform similar steps, was similarly rejected.

However, Brooks does not teach the encoder determines processing capabilities of the decoder. The cited portions of Brooks at most suggest that the encoder receives specified parameters requested by the decoder. These parameters are not the decoder's processing capabilities (as required by claim 1). It is obvious from a review of Brooks that the decoder may be capable of processing video encoded in any number of ways, and the parameters transmitted to the decoder are just one example of what the decoder is capable of processing.

Moreover, the cited portions of Brooks certainly fail to teach or suggest that the encoder increases video quality as a function of an encoder model of decoder processing load to take advantage of decoder processing capability that would otherwise be unused. Brooks teaches that the encoder only delivers video encoded as specified by the decoder. Brooks lacks any teaching or suggestion that the encoder has any information regarding the processing capabilities of the decoder, much less a model of the decoder's processing load. Again, Brooks only teaches that the encoder receives particular video encoding parameters, not information sufficient for the encoder to determine the processing capabilities of the decoder and model the decoder's processing load. Furthermore, Brooks clearly lacks any teaching that the encoder will increase video quality to take advantage of unused decoder processing capacity. As noted above, Brooks teaches that the encoder will send only what is requested by the decoder, thus it cannot increase video quality except in response to the encoder sending new parameters for how video is to be encoded, which is not in response to an encoder model of decoder processing load. Additionally, Brooks is entirely silent as to unused decoder processing capability.

Therefore, the rejection of claims 22 and 27 as anticipated by Brooks is improper.

Examiner responds to this argument with the proposition that Brooks discloses decoders of various capability and that the video encoding parameters specified by the decoder are derived as a function of these capabilities. (*See* Office Action Mailed November 14, 2008 at 4.)

However, this response is critically flawed. First, Examiner's rebuttal does not change the simple fact that Brooks teaches that the decoder specifies the video encoding parameters, and the encoder is not free to change them in response to anything other than a new request from the decoder. Second, Examiner's rebuttal does not address the fact that the encoder does not have access to the decoder's processing capabilities, but merely receives encoding parameters specified by the decoder, and thus cannot possibly have a decoder model of encoder processing load. Finally, Examiner's rebuttal is totally silent as to the absence of any teaching in Brooks that the encoder can increase video quality to take advantage of decoder processing capability that would otherwise be unused.

In view of the foregoing, reversal of the Examiner's rejection of claims 22 and 27, as well as claims 23–26 and 30–31, as anticipated by Brooks is requested.

B. Claims 1–21, 28–29, and 32–33 Are Not Obvious Over Brooks In View Of Sekiguchi

Independent claim 1 is drawn to a method of video processing and recites four limitations. These are: (1) determining one or more processing capabilities of a decoder that will decode the video sequence; (2) encoding macroblocks of a first image; (3) encoding macroblocks of subsequent images, wherein some macroblocks are skipped; and (4) increasing video quality as a function of macroblocks that are skipped to take advantage of decoder processing capability that would otherwise be unused as a result of the skipped macroblocks. At least two of the cited limitations, namely "determining one or more processing capabilities of a decoder ..." and "increasing video quality as a function of macroblocks that are skipped to take advantage of decoder processing capability that would otherwise be unused as a result of the skipped macroblocks" are not found in the cited art. Independent claim 15 is drawn to a video conferencing terminal and includes similar limitations, namely, a communication interface that "determine[s] one or more processing capabilities of a decoder..." and "increase[s] video quality as a function of macroblocks that are skipped to take advantage of decoder processing capability that would otherwise be unused as a result of the skipped macroblocks." Claims 2–14 and 16–21 depend from claims 1 and 15, respectively. Claims 28–29 and 32–33 depend from claims 22 and 27, respectively. Each of these claims is allowable for at least the reasons set forth below.

Examiner contends that claims 1 and 15 are obvious over Brooks in view of Sekiguchi. Specifically, Examiner contends that the limitations of claim 1 and 15 reciting "determining one or more processing capabilities of a decoder that will decode the video transmission" are met by Brooks at Fig. 6A, elements 810, 840, and 870. Office Action Mailed November 14, 2008 at 7. In summarizing these teachings, Examiner further states that "the video stream is manipulated to meet a target output color depth, resolution, and frame rate." *Id.* There is nothing about manipulating a video stream to meet a target output color depth, resolution, and frame rate that requires or even relates to "determining one or more processing capabilities of a decoder." The cited portions of Brooks describe a method of transcoding video and describe techniques for matching the input video stream parameters (color depth, resolution, and frame rate) to the specified output parameters given to the transcoder. Examiner has cited no teaching or suggestion in Brooks that relates to determining processing capabilities of a decoder.

Furthermore, both claims 1 and 15 recite "increasing video quality as a function of a fraction of macroblocks that are skipped to take advantage of decoder processing capability that would otherwise be unused as a result of the skipped macroblocks." Applicants' specification teaches various examples of "increasing video quality" such as increasing frame rate and picture size. Other ways to increase the video quality are also contemplated, such as a finer degree of quantization, etc. Each of these examples is given to aid in understanding of the context of the invention, and are not intended to limit the claim language quoted above.

Examiner contends that this limitation is met by Brooks in Fig. 6A; col. 3, ll. 8–14. Office Action Mailed November 14, 2008 at 7. However, the cited passages do not teach or suggest "increasing video quality as a function of a fraction of macroblocks that are skipped…." In fact, the cited passages are entirely silent as to macroblock skipping, much less increasing video quality as a function of a fraction of macroblocks that are skipped. Moreover, in his very next sentence Examiner concedes that "Brooks does not specifically disclose encoding macroblocks … wherein some macroblocks are skipped and determining a target video quality … as a function of a fraction of macroblocks that are skipped." *Id.* If Brooks does not disclose determining video quality as a function of macroblocks that are skipped, then it cannot meet the referenced limitation of claim 1, which clearly requires "increasing video quality as a function of a fraction of macroblocks that are skipped…."

Examiner goes on to propose Sekiguchi as teaching the missing limitation "increasing video quality as a function of a fraction of macroblocks that are skipped...." Examiner cites Fig. 2, element ST0; Fig. 7, coding mode estimator 8; and ¶¶ [0127]–[0130] as teaching this limitation. *Id.* Specifically, Examiner states that Sekiguchi teaches that "the coding mode is determined by analyzing a cost function if the frame is a mix of skipped blocks and non-skipped blocks." *Id.* However, the determination of a coding mode in Sekiguchi is not an increase in video quality (as recited in claims 1 and 15), but rather a selection of a technique for most efficiently representing the data that is to be encoded. As with Brooks, Sekiguchi contains no teaching or suggestion of "increasing video quality as a function of a fraction of macroblocks that are skipped...."

As with claims 22 and 27, Examiner responds to this argument with the proposition that Brooks discloses decoders of various capability and that the video encoding parameters specified by the decoder are derived as a function of these capabilities. (*See* Office Action Mailed November 14, 2008 at 2.) As noted above with respect to claims 22 and 27, this response by Examiner is critically flawed because Brooks' encoder cannot increase video quality in response to anything other than an instruction from the decoder, and certainly not as a function of a fraction of macroblocks that are skipped to take advantage of decoder capability that would otherwise be unused. Examiner's voluminous recitation (and mischaracterization) of Sekiguchi highlights the absence of this teaching. *See* Office Action Mailed November 14, 2008 at 2–3. Review of Examiner's summary and the corresponding portions of Sekiguchi plainly show that Sekiguchi teaches improving coding efficiency (*i.e.*, reducing bit rate) by skipping certain macroblocks, not increasing video quality in response to a decision to skip macroblocks.

In view of the foregoing, reversal of the Examiner's rejection of claims 1–21, 28–29, and 32–33 is requested.

C. Conclusion

Because the rejections of each independent claim as anticipated by Brooks or as obvious over Brooks in view of Sekiguchi are improper, the rejections of claims depending therefrom are also improper. Therefore, Applicants respectfully submit that all outstanding rejections should be reversed. Additionally, to the extent specific claims have not been addressed, these claims depend from one or more claims that are specifically addressed, and are therefore patentable for

at least the same reasons as the claims specifically addressed. Applicants further believe that they have complied with each requirement for an appeal brief.

In the course of the foregoing discussions, Applicants may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as a whole, and each limitation of the claims must be considered when determining the patentability of the claims. Moreover, it should be understood that there may be other distinctions between the claims and the prior art which have yet to be raised, but which may be raised in the future.

If any fees are required or have been overpaid, please appropriately charge or credit those fees to Deposit Account Number 501922, referencing docket number 199-0231US.

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Respectfully submitted,

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Filed Electronically

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VIII. CLAIMS APPENDIX

1. (original) A method of quality-improvement of a digitally-encoded video sequence, wherein the video sequence comprises information representing a sequence of encoded frames, each encoded frame comprising one or more encoded macroblocks, the method comprising:

   determining one or more processing capabilities of a decoder that will decode the video sequence;

   encoding macroblocks of a first image;

   encoding macroblocks of subsequent images, wherein some macroblocks are skipped;

   and increasing video quality as a function of a fraction of macroblocks that are skipped to take advantage of decoder processing capability that would otherwise be unused as a result of the skipped macroblocks.

2. (original) The method of claim 1 wherein the step of determining one or more processing capabilities of a decoder comprises having prior knowledge of the decoder type.

3. (original) The method of claim 1 wherein the step of determining one or more processing capabilities of the decoder comprises receiving processing capability information from the decoder.

4. (original) The method of claim 1 wherein the step of determining one or more processing capabilities of the decoder comprises determining the number of macroblocks that can be decoded in a given interval if all macroblocks are skipped.

5. (original) The method of claim 4 wherein the step of increasing the video transmission frame rate comprises determining the maximum frame rate in accordance with the following expression:

$$MaxFrameRate = \frac{1}{\dfrac{N_{coded}}{MaxMBPS} + \dfrac{N_{skipped}}{MaxSKIPPED}}$$

where N_{coded} is the number of coded macroblocks, $N_{skipped}$ is the number of skipped macroblocks, MaxMBPS is the maximum number of macroblocks that can be decoded in a given interval, and MaxSKIPPED is the maximum number of macroblocks that can be decoded in a given interval if all macroblocks are skipped.

6. (original) The method of claim 1 wherein the step of increasing video quality comprises increasing a video frame rate.

7. (original) The method of claim 1 wherein the step of increasing video quality comprises increasing a video picture size.

8. (original) The method of claim 1 wherein the step of increasing video quality further comprises increasing a video frame rate as a function of a computational cost of the decoder to decode various types of macroblocks.

9. (original) The method of claim 1 wherein the step of increasing video quality further comprises increasing a video picture size as a function of a computational cost of the decoder to decode various types of macroblocks.

10. (original) The method of claim 1 further comprising: taking account of a number of coefficients included in the encoded macroblocks and a computational requirement of the decoder as a function of this number.

11. (original) The method of claim 10 wherein the step of increasing video quality comprises increasing a video frame rate.

12. (original) The method of claim 10 wherein the step of increasing video quality comprises increasing a video picture size.

13. (original) The method of claim 10 wherein the step of increasing video quality further comprises increasing a video frame rate as a function of a computational cost of the decoder to decode various types of macroblocks.

14. (original) The method of claim 10 wherein the step of increasing video quality further comprises increasing a video picture size as a function of a computational cost of the decoder to decode various types of macroblocks.

15. (original) A video conferencing terminal adapted to produce encoded video including a sequence of encoded frames, each encoded frame comprising one or more encoded macroblocks, the video conferencing terminal comprising:

one or more image processing engines adapted to encode a video signal, wherein some macroblocks are skipped; and

a communication interface adapted to determine one or more processing capabilities of a decoder that will decode the encoded video and further adapted to increase video quality as a function of a fraction of macroblocks that are skipped to take advantage of decoder processing capability that would otherwise be unused as a result of the skipped macroblocks.

16. (original) The video conferencing terminal of claim 15 wherein the processing capability of the decoder is determined as a function the number of macroblocks that can be decoded in a given interval if all macroblocks are skipped.

17. (original) The video conferencing terminal of claim 17 wherein a maximum frame rate is determined in accordance with the following expression:

$$MaxFrameRate = \frac{1}{\frac{N_{coded}}{MaxMBPS} + \frac{N_{skipped}}{MaxSKIPPED}}$$

where N_{coded} is the number of coded macroblocks, $N_{skipped}$ is the number of skipped macroblocks, MaxMBPS is the maximum number of macroblocks that can be decoded in a given interval, and MaxSKIPPED is the maximum number of macroblocks that can be decoded in a given interval if all macroblocks are skipped.

18. (original) The video conferencing terminal of claim 15 wherein video quality is increased by increasing a frame rate.

19. (original) The video conferencing terminal of claim 15 wherein video quality is increased by increasing an picture size.

20. (original) The video conferencing terminal of claim 18 wherein the frame rate is further determined as a function of a computational cost of the decoder to decode various types of macroblocks.

21. (original) The video conferencing terminal of claim 19 wherein the picture size is further determined as a function of a computational cost of the decoder to decode various types of macroblocks.

22. (original) A method of quality-improvement of a digitally-encoded video sequence, the method comprising:

determining one or more processing capabilities of a decoder that will decode the video sequence; and

increasing video quality as a function of an encoder model of decoder processing load to take advantage of decoder processing capability that would otherwise be unused.

23. (original) The method of claim 22 wherein the step of determining one or more processing capabilities of a decoder comprises having prior knowledge of the decoder type.

24. (original) The method of claim 22 wherein the step of determining one or more processing capabilities of the decoder comprises receiving processing capability information from the decoder.

25. (original) The method of claim 22 wherein the step of increasing video quality comprises increasing a video frame rate.

26. (original) The method of claim 22 wherein the step of increasing video quality comprises increasing a video picture size.

27. (original) A video encoder for generating an encoded video sequence, comprising:

one or more image processing engines adapted to:

encode a video signal;
determine one or more processing capabilities of a decoder that will decode the encoded video sequence; and
increase video quality as a function of an encoder model of decoder processing load to take advantage of decoder processing capability that would otherwise be unused.

28. (original) The video encoder of claim 27 wherein the processing capabilities of the decoder are determined as a function a number of macroblocks that can be decoded in a given interval if all macroblocks are skipped.

29. (original) The video encoder of claim 28 wherein a maximum frame rate is determined in accordance with the following expression:

$$MaxFrameRate = \frac{1}{\frac{N_{coded}}{MaxMBPS} + \frac{N_{skipped}}{MaxSKIPPED}}$$

where N_{coded} is the number of coded macroblocks, $N_{skipped}$ is the number of skipped macroblocks, MaxMBPS is the maximum number of macroblocks that can be decoded in a given interval, and MaxSKIPPED is the maximum number of macroblocks that can be decoded in a given interval if all macroblocks are skipped.

30. (original) The video encoder of claim 27 wherein video quality is increased by increasing a frame rate.

31. (original) The video encoder of claim 27 wherein video quality is increased by increasing an picture size.

32. (original) The video encoder of claim 30 wherein the frame rate is further determined as a function of a computational cost of the decoder to decode various types of macroblocks.

33. (original) The video encoder of claim 31 wherein the picture size is further determined as a function of a computational cost of the decoder to decode various types of macroblocks.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.